

Interactive comment on “Analyses of relationship between Loess Plateau erosion and sunspots based on wavelet transform” by P. Gao et al.

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The paper confirms the linkage between variations in solar activity as evidenced by sunspot cycles, and soil erosion. Understandably there are discrepancies in the correlation. There are three reasons for this. The first is the use of the single sunspot cycles instead of the statistically significant double sunspot cycles. A simple serial correlation analysis of the sunspot data would have demonstrated the presence of statistically significant 21-year periodicity in the data but minimal 11-year periodicity in the data.

Secondly, it would have been more instructive if the authors had commenced their studies by searching for periodicities in both the annual sunspot numbers and separately in annual river flows. The next step should have been to determine whether there was a meaningful similarity between the two. For example, Alexander 2005 referenced

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in the paper demonstrated a statistically significant 21-year periodicity in annual river flows and the direct correlation with sudden changes from drought to flood conditions that were closely synchronous with the occurrence of sunspot minima and not sunspot maxima.

The third issue relates to the soil erosion process itself. Although not the purpose of the paper it is nevertheless important that it be understood when searching for correlations with variations in solar activity. This is a short summary.

The detachment and transport of sediment during runoff events will depend on which of several factors are limiting at the particular site and at the particular time. These include the detachment and transporting processes as well as the factors that control the availability of transportable material. These are complex and interrelated.

Given all the above it would be remarkable if a linkage was detectable between sunspot numbers and soil erosion against the highly noisy background. The very fact that a weak linkage was found to exist against this background is very significant. This is not sufficiently explained by the authors.

The paper is nevertheless a significant advancement of our knowledge in this field.

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